



WWF

REPORT

CAN

2017

LIVING PLANET REPORT CANADA

A national look at wildlife loss



WWF

50 YEARS
OF CONSERVATION
IN CANADA

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*WWF-Canada is committed to creating conditions
to reverse the steep decline of wildlife.
Our Canada has healthy and resilient ecosystems
that provide critical habitats for wildlife,
and is a place where nature and people thrive.*

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Patrick and Barbara
Keenan Foundation

WILDLIFE LOSS: A CANADIAN PROBLEM?

When WWF International and the Zoological Society of London release the biennial global Living Planet Report on wildlife loss, it's easy to assume the shocking figures of decline don't apply here. Canada, after all, is a country of wide open spaces with ample room for grizzlies and gannets, belugas and bass, salamanders and swift foxes — isn't it?



In early 2016 we set out to discover if this assumption aligned with reality.

After 18 months of research — during which we studied 3,689 population trends for 903 monitored vertebrate species in Canada, for the period 1970 to 2014 — the results are in. And the findings surprised even us.

WWF-Canada's Living Planet Index shows that half of our monitored species (451 of 903) are in decline. And of those, the index shows an average decline of 83 per cent.

Yes, it's true the other half of the monitored species in our study are either stable or faring well. We know that in some cases, wildlife did well because we, as a society, took action to protect species or their habitat. We put tight restrictions on dangerous chemicals like DDT. We closed fisheries and put limits on hunting. We restored wetlands to give waterfowl a chance to rebound. Clearly we have the power to make a difference.

But it isn't time to celebrate, yet. We have to pay attention to the wildlife in trouble here at home, to figure out which species most need our help. In this report you'll find staggering numbers of wildlife population loss — here in Canada. Mammal populations, for example, fell on average by 43 per cent; grassland birds suffered 69 per cent loss; reptile and amphibian populations dropped almost 34 per cent, and fish populations declined by 20 per cent. Surprisingly, the numbers for at-risk species, those protected by law, are just as bad — if not worse.

Wildlife loss is not someone else's problem. It's a Canadian problem. At the back of this report you'll find roles for individuals, communities, academic institutions, industry and government willing to be part of the solution. We all, collectively, have a moral duty — and a self-interest — to halt wildlife decline.

David Miller

President and CEO
World Wildlife Fund Canada



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CONSERVATION IN THE 21ST CENTURY

As human actions transform the natural world, Earth's ecological systems are undergoing fundamental change, the consequences of which are breathtaking in scope and speed. Biological diversity is undergoing such catastrophic declines that scientists, in peer-reviewed studies, are describing "biological annihilation" and warning of a sixth mass extinction in a historically unparalleled time-frame.



To tackle biodiversity conservation in the face of increasing development pressures and climate change, WWF-Canada draws upon scientific principles, leading-edge quantitative analysis and innovative tools to ensure evidence-based decision-making, and to increase the likelihood of success. This is conservation in the 21st century; the Living Planet Index is one such tool.

A robust indicator for reporting on the status of global biodiversity, the index was developed by the Zoological Society of London using a peer-reviewed methodology to synthesize time-series data on population sizes for vertebrate species around the world. This established approach to reporting on broad wildlife trends uses: 1) a clear set of standardized criteria to establish the types of monitoring data that are appropriate for comparison in the index; 2) an accepted approach to integrating measures of relative abundance across species; and 3) advanced techniques in modelling to calculate an aggregated measure of the changes in wildlife populations over time.

To complete a Canada-specific analysis on wildlife populations using the Living Planet Index, our scientists compiled a broad range of studies tracking changes in populations of wildlife across the country. We added monitoring data for 418 species, more than 2,000 populations, and 86 data sources to the centralized Living Planet dataset for Canada.

We looked at trends for wildlife nationally overall and by realm (terrestrial, freshwater and marine). And then we dug deeper to see what these national-level findings alone couldn't reveal. We ran analyses on taxonomic groups (mammals, birds, fish, amphibians and reptiles) and even examined regional trends. Then we validated our analysis with peer-reviewed scientific literature, and through consultation with leading experts across the country.

Living Planet Report Canada serves as a guide to conservation action in the 21st century. Which groups of species require greater conservation effort? What are the appropriate strategies for action? Our findings provide insight into these questions and more.

James Snider

Vice-president science, research and innovation
World Wildlife Fund Canada



WHY MONITOR CANADA'S WILDLIFE

Dramatic human changes to natural systems ... are jeopardizing diversity and abundance of species.

Canada is a vast and varied land. Polar bears prowl the frigid Arctic, rattlesnakes coil in Alberta's arid badlands, salmon on both the Pacific and Atlantic coasts migrate from saltwater up freshwater streams to spawn. About 40 per cent of the country is forests and woodlands — almost a tenth of the world's total forest cover.¹ A quarter of Earth's wetlands are found here, as well as 8,500 rivers and more than two million freshwater lakes.² Scientists now estimate about 80,000 known species³ live in Canada (not including viruses and bacteria), a grand multitude of diversity.

It's this rich wilderness for which we are responsible. Yet, dramatic human changes to natural systems — on which we depend for clean air and water, food and medicines, materials and fuel, and even for capturing greenhouse gases that affect our climate — are jeopardizing diversity and abundance of species.

By analyzing population trends of major animal groups, the Living Planet Index is a broad indicator of the state of biodiversity. The index is focused on the vertebrate group of the animal kingdom; vertebrates include mammals, birds, amphibians, reptiles and fish species, including sharks, rays and skates. Altogether, the Living Planet Index for Canada includes population trends for the period 1970 to 2014 for 903 monitored vertebrate species (about half of the known vertebrates in Canada) including 106 species of mammals, 386 bird species, 365 fish species, and 46 amphibians and reptiles. (The index does not include the invertebrate group of animals; only a small fraction of this large group has long-term monitoring data that would be comparable for inclusion in this study.)

There have been successes, in that time, which is heartening. But as a wildlife conservation organization, it's our duty to use the Living Planet Index to identify groups of species that are in decline, and determine if and where patterns exist. This analysis can identify key population trends that can then be used to identify priority areas for conservation efforts, to ensure the recovery and long-term survival of wildlife in Canada.



WHAT IS A LIVING PLANET INDEX?

Similar to the way a stock market index measures economic performance,⁴ a Living Planet Index measures a nation's ecological performance. Rather than a daily indicator, it's an indicator of broad patterns of wildlife abundance over time, and is calculated using multiple datasets for different populations of each of the vertebrate species included in the study. (One species, like the woodland caribou, for example, may have many different populations.) More than 400 sources of data on species population sizes were included in the calculation of the Living Planet Index for

Canada, including peer-reviewed scientific literature, government monitoring (for example, Fisheries and Oceans Canada (DFO) Research Vessel Trawl Surveys) and citizen science (for example, the North American Breeding Bird Survey). Criteria for the inclusion of species population data in the index followed the methods of previous international Living Planet reports, as developed by the Zoological Society of London:⁴

- Populations must be consistently monitored in the same location, using the same method over time, for a minimum of two consecutive years.
- Data must be numerical (i.e., a population count or a reliable population-size proxy, such as population estimates, spawning biomass, catch-per-unit effort, density, etc.).
- Population data must be available for at least two years in the period between 1970 and 2016. (A lack of available data in 2015 and 2016 — primarily due to a lag in scientific publishing — meant trends in the index are reported to 2014.)
- Data sources must be referenced and traceable.
- In addition, for this national-scale study, species must be native to the country.

HOW TO READ THE INDEX

The Living Planet Index has a benchmark value of 1.0 in 1970. An increase in the index would represent an increase in wildlife population abundances and would be evident as an upward trend in the index value over time. The magnitude of the change in the Living Planet Index can be reported as a percentage — if the index value increases from 1 to 1.2, that's an increase of 20 per cent. The opposite is true for decreases in abundance: A decrease from 1 to 0.8 is a decrease of 20 per cent; a decrease from 1 to 0.2 is 80 per cent. Any finding within five per cent of the baseline is considered stable.

In calculating the Living Planet Index, population counts of zero were treated as missing values, which could simply mean a species wasn't observed in a particular year, or that local populations of a species have already gone extinct. Therefore, the index figures should be interpreted as conservative estimates of change. (*For more information about how the index is calculated, see wwf.ca/lprc_technical*)



CANADA'S LIVING PLANET INDEX

The national Living Planet Index examines the status of 903 vertebrate species in Canada by assessing trends in 3,689 monitored populations between 1970 and 2014. Forty per cent of the monitored species included in the LPI live in marine environments, 36 per cent are terrestrial, and 24 per cent are freshwater species. Birds and fish are the primary taxonomic groups in the national index, accounting for 43 per cent and 40 per cent of the species in the study, respectively (Figure 1b). The national index also includes mammals (12 per cent), and amphibians and reptiles (five per cent).

From 1970 to 2014, the national Living Planet Index reports an average downward trend in population size of eight per cent for monitored vertebrate populations in Canada (Figure 1a). The LPI value ranges from a maximum of minus two per cent to a minimum value of minus 14 per cent.

National Living Planet Index

Figure 1a. The LPI shows a decline of 8 per cent (range: -2 to -14 per cent) between 1970 and 2014.

Trend in population abundance for 3,689 monitored populations of 903 vertebrate species (WWF-Canada, 2017).

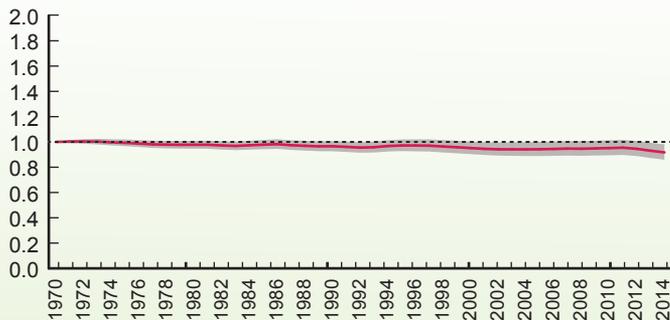
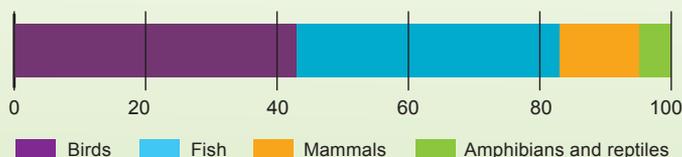


Figure 1b. Relative proportion of major species groups included in the LPI (903 vertebrate species)



THE STATE OF WILDLIFE

Since the national Living Planet Index is an average of trends in abundance for Canadian wildlife, it masks nuances of particular species groups. Closer examination reveals that, from 1970 to 2014, half (451 of 903) of monitored wildlife species in Canada declined in abundance. This is true for all wildlife groups: Approximately half of the mammals (54 per cent), fish (51 per cent), birds (48 per cent), and amphibians and reptiles (50 per cent) included in the analysis exhibited declining trends during this time (Figure 2).

Of the other half monitored, 407 species showed increases in abundance. Some species in this group were recipients of targeted conservation efforts (some waterfowl); others fared well from human-built environments (geese); others benefitted from changes in human behaviour like banning the pesticide DDT (raptors). Some species are generalists, meaning they live in a wide variety of habitats and eat a wide variety of foods, and more easily adapt to changes in their environment. Furthermore, for some of these species, the baseline year of 1970 may capture a period of especially low population numbers — an increase from 1970, then, doesn't necessarily mean the population has reached a healthy level.

Forty-five species showed stable trends. However, because some species' populations were already degraded in 1970, a stable trend could also mask unhealthy population numbers.

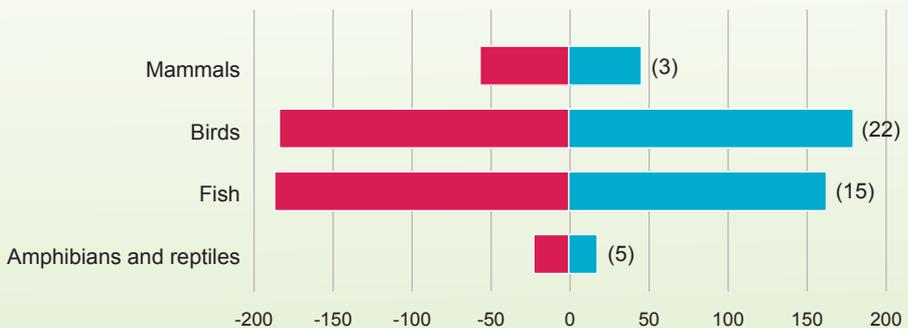


Figure 2. Number of vertebrate species increasing and decreasing in population abundance. Stable population trends are in parentheses.

Trend in population abundance for 903 vertebrate species (WWF-Canada, 2017).



A CLOSER LOOK AT DECLINE

For the half of monitored species with declining trends, the Living Planet Index shows, on average, a decline of 83 per cent, from 1970 to 2014 (Figure 3). Furthermore, for species in decline, the annual rate of decline is four per cent.

In the next chapters, this study will examine, in more depth, patterns in wildlife populations in Canada's marine, terrestrial and freshwater environments, in different regions from coast to coast to coast, and for the major groups of species (mammals, fish, birds, amphibians and reptiles). Through this closer examination, specific wildlife groups experiencing the most significant changes are identified, so the cause of decline can be better understood and recommendations made for combatting future wildlife loss.

Declining wildlife Living Planet Index

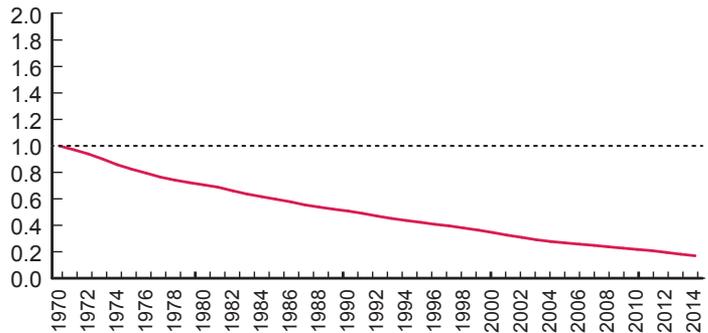


Figure 3. Of the 451 species experiencing population declines, the LPI shows an average decline of 83 per cent (range: -81 to -84 per cent) between 1970 and 2014. Trend in population abundance for 2,066 monitored populations of 451 vertebrate species (WWF-Canada, 2017).



WHAT'S DRIVING WILDLIFE LOSS?

HABITAT LOSS

Habitat loss is the greatest threat to species in Canada,^{5,6} including listed at-risk species,⁷ from forestry, agriculture,⁸ urbanization and industrial development. City growth has doubled in Canada over the last century, sprawling into and over habitat.⁶ According to Global Forest Watch Canada, almost 216,000 square kilometres (or an area three times the size of New Brunswick) of intact forests in Canada were disturbed or fragmented between 2000 and 2013.⁹ Over 80 per cent of original wetland habitat has been converted to other uses in and near cities. Dams, canals and waterfront development degrade or permanently alter habitat in and around lakes, rivers, streams and along sea coasts.

CLIMATE CHANGE

In Canada, the rate of warming has increased at nearly double the global average (approximately 0.85°C, from 1880 to 2012).¹⁰ Impacts are being felt across the country, from warmer and more acidic oceans to shifting seasons (and corresponding life-cycle events for wildlife species). Different species are feeling the effects in different ways. The most vulnerable species are long-lived, slow to reproduce, require specialized habitats and foods, and are unable to move in response. For example, low water levels and temperature extremes recently created lethal conditions for sockeye salmon.¹¹ And for many reptiles, sex is temperature-determined: Heat can change populations to mostly female, putting these species at risk.¹²

POLLUTION

Some persistent chemical pollutants (e.g., DDT, PCBs) have been banned or tightly restricted for use, but many detrimental pesticides and other pollutants remain,¹³ including sewage effluent (which increases with a growing human population) and agricultural runoff. Plastic waste and microplastics harm wildlife habitat. Heat, noise¹⁴ and light pollution from ships, cities and factories disturb wildlife and transform environments.





UNSUSTAINABLE HARVEST

In all three realms, overexploitation has taken its toll. In particular, marine fish along our East Coast have been the most affected, such as Atlantic cod, whose stocks collapsed in the early 1990s.¹⁸ Bycatch, the incidental catch of other species by fisheries, is a compounding factor. Porbeagle sharks, for example, in the northwestern Atlantic have been reduced to just a quarter of their 1961 population,¹⁹ both through commercial fishery and as incidental bycatch.

INVASIVE SPECIES

Introduced species compete with native species for space, food and other resources; and some prey on native species. For instance, zebra and quagga mussels, brought to the Great Lakes through ship ballast water, have contributed to the decline of lake whitefish.¹⁵ The rate of invasions is gathering momentum as human travel and transport of goods increases,¹⁶ coinciding with climate-driven ecosystem changes.¹⁷

CUMULATIVE AND CASCADING EFFECTS

Stressors don't act in isolation; their effects are cumulative (meaning simultaneous and/or synergistic) and cascading (changes in the status of one species triggers changes in the other, generally referring to the food web). According to scientists, at-risk species face more than two broad-scale threats (on average) at the same time.⁵ For instance, wolverines at the southern and eastern portions of their Canadian range are experiencing habitat loss and fragmentation from both climate change^{20,21} and increasing development, as well as a shortage of food as woodland caribou populations decline.²²

CANADA'S SPECIES AT RISK ACT

How it works

The rate of decline of these at-risk species may actually have increased ... despite protections afforded by SARA.

At the federal level in Canada, the primary legal mechanism for protection of imperiled species is the Species at Risk Act, or SARA (2002). The first step toward receiving protections under the Act is a status assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), a national panel of academics, government and non-government biologists and experts. This panel meets twice a year to assess a species as Extinct, Extirpated, Endangered, Threatened, of Special Concern, Data Deficient or Not at Risk (based on scientific and local evidence, against firm criteria) and makes recommendations to the Minister of Environment and Climate Change Canada (ECCC). Those recommendations are either sent up to the Governor-in-Council (which has nine months to either accept or reject the recommendation, or refer it back to COSEWIC for more information), or over to agencies like Fisheries and Oceans Canada or Parks Canada, and to stakeholder groups, for further consultation. Socioeconomic concerns — whether people's livelihoods will be affected by the decision — are considered. As of 2017, approximately one-third of vertebrate populations assessed to be at risk by COSEWIC had not been officially listed under SARA.

Automatic prohibitions against killing or harming the species, or destroying its habitat, are triggered by a SARA listing. Recovery strategies and action plans are required for species listed as Threatened or Endangered. Clear timelines exist: Recovery strategies must be completed within two years for species listed as Threatened, and within one year for species listed as Endangered. Importantly, for these species, critical habitat must be defined in either the recovery strategy or the action plan — though there is no legally defined timeframe for completion of action plans.

The federal authority for protection of critical habitat under SARA is limited to areas under federal jurisdiction (except where additional mandates under the Fisheries Act and Migratory Birds Act extend protections to private lands). The provinces and territories have a critical role in implementing protection and recovery measures (such as the Endangered Species Act in Ontario and the Wildlife Act in British Columbia) for species at risk.



SPECIES UNDER SARA PROTECTION

When we look retroactively to 1970 (from 2014), those species in our analyses that would eventually become listed under SARA show a decline in the Living Planet Index, on average, of 63 per cent (based on data from 256 populations of 87 species).

Consistent declining trends were also observed when analyzing the periods before and after SARA was enacted. For comparability, this analysis was limited to 64 SARA-listed species with data records in both study periods. In the 1970-2002 period, the SARA-listed species showed an average population decline of 43 per cent and an average annual decline of 1.7 per cent (Figure 4).

From 2002 to 2014 (post legislation), these populations declined, on average, by 28 per cent — with an average annual decline of 2.7 per cent (Figure 5). These results suggest the rate of decline of these at-risk species may actually have increased (to 2.7 per cent from 1.7 per cent), despite protections afforded by SARA.

Figure 4. The LPI shows a decline of 43 per cent (range: -32 to -52 per cent) between 1970 and 2002, with an average annual decline of 1.7 per cent.
Trend in population abundance for 184 monitored populations of 64 SARA-listed vertebrate species (WWF-Canada, 2017).

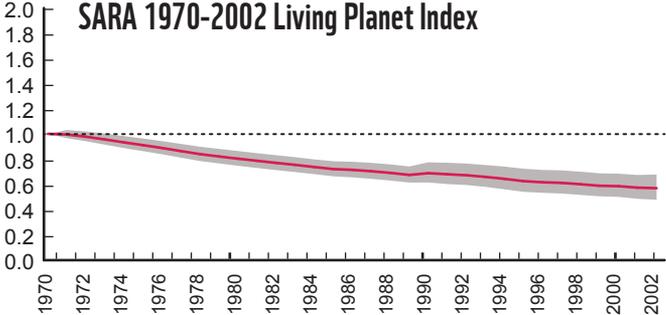


Figure 5. The LPI shows a decline of 28 per cent (range: -14 to -41 per cent) between 2002 and 2014, with an annual average decline of 2.7 per cent.
Trend in population abundance for 154 monitored populations of 64 SARA-listed vertebrate species (WWF-Canada, 2017).

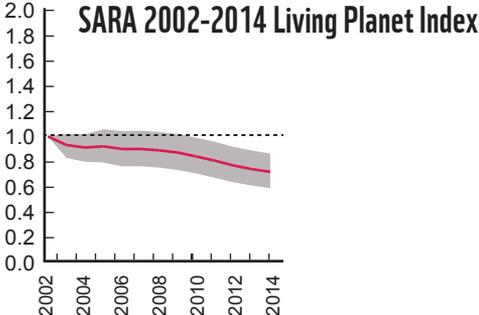
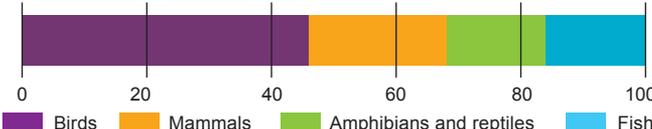


Figure 6. Relative proportion of major species groups included in both SARA LPIs (64 vertebrate species)



However, it is important to remember that although SARA was enacted in 2002, some species were listed (and received protections) years later. For long-lived species that are slow to reach sexual maturity, and have relatively few offspring, it can take decades before populations improve which suggests for some species the benefits of SARA need more time to take effect.

SPECIES RECOMMENDED FOR PROTECTION

The Living Planet Index of SARA-listed species shows population declines of wildlife that made the list as species at risk and receive protection. What happened to species assessed as at-risk but not listed?

For COSEWIC-assessed at-risk vertebrate wildlife, the Living Planet Index shows that monitored populations have declined by 64 per cent, on average, since 1970 (based on 61 species from 335 populations) (Figure 7a).

Figure 7a. The LPI shows a decline of 64 per cent (range: -54 to -71 per cent) between 1970 and 2014.
Trend in population abundance for 335 monitored populations of 61 COSEWIC-assessed at-risk vertebrate species (WWF-Canada, 2017).

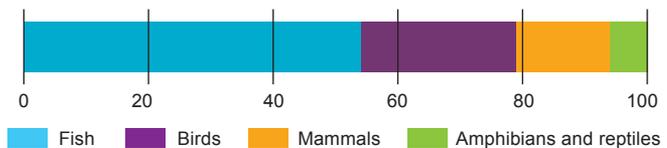
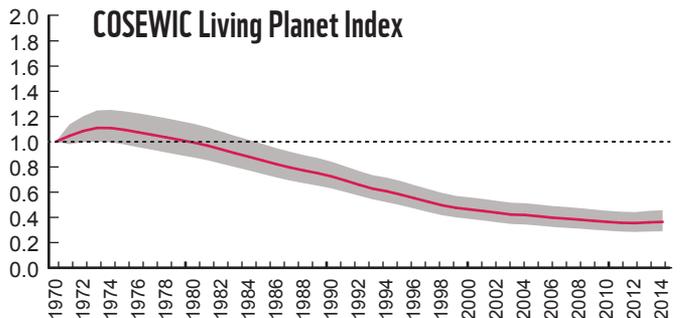


Figure 7b. Relative proportion of major species groups included in the LPI (61 vertebrate species)



SHORTCOMINGS IN THE PROCESS

Legal deadlines for developing recovery strategies are routinely extended or overdue — often by many years.

According to researchers, the federal Species at Risk Act (SARA) has faltered in its mission to protect Canada’s most beleaguered wildlife.^{24,25} Scientists point to: 1) government delays to listing on SARA; 2) government failures to meet SARA’s timelines for recovery strategies and in identifying and protecting critical habitat; 3) government’s deference to socioeconomic considerations when deciding whether to list a species under SARA; and 4) a lack of adequate funding to support recovery plans and stewardship requirements to recover species and make wildlife populations viable again.

1) DELAYS TO LISTING

Even after species are designated Endangered or Threatened by COSEWIC, years may pass before government moves to legally list and protect them. Between 2011 and 2015, for example, none of the species recommended for listing under SARA by the COSEWIC expert panel (and without previous protection under the law) were listed²⁶ — except for three bats, whose emergency listing as Endangered was demanded by the government of Nova Scotia. In many of these cases, the federal government failed to set a deadline on consultation with designated stakeholder groups for sending listing recommendations to cabinet. More recently, the pace of SARA listing of COSEWIC-assessed species has improved. (Twenty-seven species have been listed by the new federal government as Special Concern, Threatened or Endangered.)

2) DELAYS TO ACTION

For many species at risk listed under SARA, legal deadlines for developing recovery strategies are routinely extended or overdue — often by many years. Under the law, recovery strategies — including identifying habitat that is critical to the species’ survival — must be completed within one year of a species being listed by SARA as Endangered, and within two years for species listed as Threatened. Within 180 days of being identified, critical habitat on federal land becomes legally protected from destruction, fragmentation and alteration.



According to a 2015 study, of the 62 species of fish declared at risk of extinction and recommended for listing by COSEWIC, only 12 have received listing since 2003.

3) DEFERENCE TO SOCIOECONOMIC COSTS

As part of the SARA process, the federal government engages in public consultations to determine the social and economic impact of listing on communities and industries. As a result, many species whose harvest or habitat is deemed important to some people and economies are denied legal protection even if scientists conclude they are at risk. Marine fish provide the best example. According to a 2015 study²⁷, of the 62 species of fish declared at risk of extinction and recommended for listing by COSEWIC, only 12 have received listing since 2003. Commercially important ocean fish — such as Atlantic cod populations found to be Endangered by COSEWIC on the East Coast or chinook and sockeye salmon populations designated by the panel as Endangered on the West Coast — often don't receive a listing under SARA, which would prohibit *any* commercial harvest, with government deferring instead to other legislative acts and conservation measures.

4) LACK OF FUNDING

Enacting recovery strategies and action plans requires long-term planning, land-use change and habitat restoration, possibly species reintroduction and captive breeding, all of which involves large expenditures of money. But in the years since SARA has been in place, federal government departments charged with protecting and recovering species have repeatedly cut their species-at-risk funding. A 2013 study²⁸ comparing funding for species conservation by 199 countries around the world found Canada was barely among the top half. Recently, the downward trend for government spending for species at risk may have turned a corner. (For instance, funding for species-at-risk programs at Fisheries and Oceans Canada increased by almost \$1.5 million from 2015-16 to 2016-17, according to government figures.)²⁹



Woodland caribou

Most Canadians know the caribou's heavy head and distinctive antlers from its image on our 25-cent coin. With grey-brown coats, and thick creamy fur on their shoulders, woodland caribou abide within Canada's vast boreal forest. In small herds, these medium-size members of the deer family wander through the shadows of mature spruce and hemlock forests in search of lichen to eat. However, biologists consider the caribou to be a "canary in the coal mine," whose shrinking herds are an indicator of the overall health of the boreal ecosystem.

Logging, mining and gas development have cleared large areas of intact forest or fragmented it through the construction of roads, seismic lines and hydro corridors, restricting the movement of caribou, and making them easier prey for wolves.³⁰

The boreal populations of woodland caribou were listed as Threatened under SARA in 2003. The extensive consultation process for the recovery strategy, which involved industry, hundreds of Indigenous groups, provincial and territorial governments, was unprecedented for a species at risk in Canada. It took nearly a decade to complete. The recovery strategy was released in 2012, years past the SARA deadline. During this time, development activities continued to damage key woodland caribou habitat.

The approach to woodland caribou recovery is unique because, unlike other species, their range extends across the country. For this reason, action plans are expected from most provinces and territories, and are due by the end of 2017.



Little brown bat

The little brown bat was once commonly seen swooping for insects from British Columbia to Newfoundland and Labrador. With soft, brown fur and large ears, the little brown bat is ecologically important as a major predator of night-flying insects, including moths, beetles, flies, midges and mosquitoes. Some are known to eat their body weight's worth of prey in a single night. Scientists say Canada's bat populations have been suffering for years from habitat destruction, as colonies are eradicated from old buildings (because of fear of rabies); their large overwintering sites (often mines or caverns) are disturbed; and roosting and hunting sites in mature forests are diminished.

The fungal disease white-nose syndrome arrived in Eastern Canada in 2010. The

fungus grows on the muzzle of little brown bats while hibernating closely huddled in cave colonies or old mines. The bats are aroused too early from their sleep by the fungus, and deplete their body reserves of stored water, electrolytes and fat too soon. Within three years of discovery, white-nose syndrome had wiped out 94 per cent of hibernating little brown bats in Nova Scotia, New Brunswick, Ontario and Quebec. Some ecologists consider this the most rapid decline of mammals ever documented. The westward sweep of the disease is expected to infect the entire range in Canada by 2028.³¹ The little brown bat was emergency-listed as Endangered under SARA³² in 2014, one of three species ever to receive such treatment out of all invertebrates, vertebrates and flora.

WILDLIFE BY REALM

Canada's animals dwell in three broad environments — at sea (the marine realm), on land (the terrestrial realm), and in and around Canada's thousands of lakes, rivers and wetlands (the freshwater realm). Most animals are confined to one or the other. Think of whales at sea or cougars in our forests. But some, such as salmon, migrate between realms and, for the purposes of this report, may provide population data for more than one realm at the same time.

FRESHWATER

The freshwater system is the least-well studied of the three realms in Canada, with only 592 monitored populations for the 222 freshwater vertebrate species in the index. Furthermore, freshwater fish populations, in particular, are systematically underrepresented in long-term biodiversity monitoring in Canada. (These problems were highlighted in WWF-Canada's June 2017 *Watershed Reports*)² Poor monitoring of fish populations in lakes and rivers across Canada — as well as limited access to government data — likely confounds the accuracy of the Canadian freshwater Living Planet Index.

Furthermore, there is plentiful research to suggest that freshwater ecosystems across the country — especially in the Great Lakes, where much of the current freshwater index data is sourced — were significantly affected by human activity before 1970.³³ Therefore, the baseline year for the index, 1970, likely represents a starting point at which many freshwater ecosystems in Canada were already degraded, with some populations already negatively affected. The index shows a stable finding (within five per cent of the baseline, on average) for populations of freshwater vertebrate species between 1970 and 2014 (Figure 8a).



Figure 8a. The LPI shows a stable trend of 5 per cent (range: -9 to 21 per cent) between 1970 and 2014.

Trend in population abundance for 592 monitored populations of 222 freshwater vertebrate species (WWF-Canada, 2017).

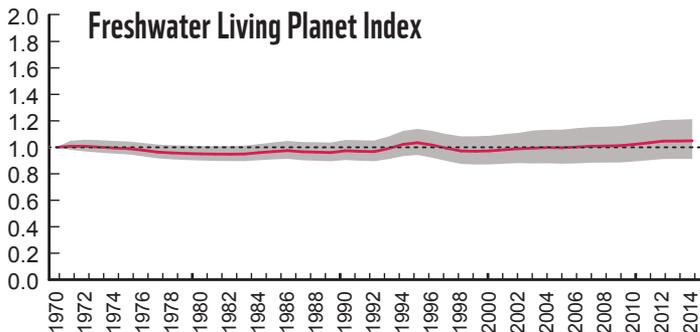
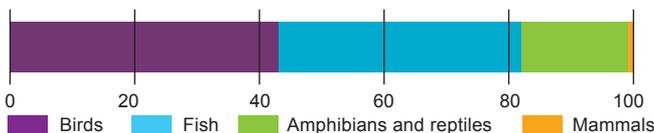


Figure 8b. Relative proportion of major species groups included in the freshwater LPI (222 vertebrate species).



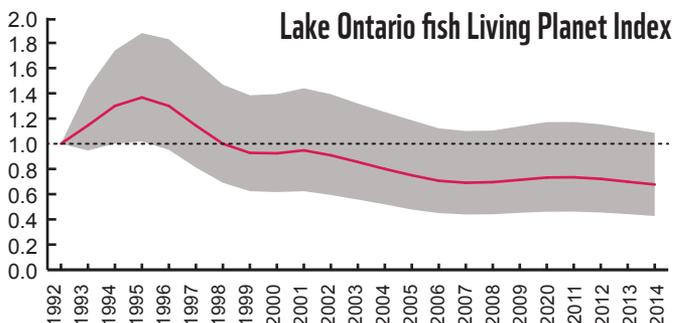
Note the large proportion of bird species in the freshwater realm data (43 per cent) (Figure 8b). The Living Planet Index is an average of monitored vertebrate population trends, not just fish. Large increases in other species like waterfowl, for example, which have benefitted from conservation initiatives, balance the declines of many other freshwater species, resulting in an overall stable trend.

According to the LPI, populations of native fish species in Lake Ontario dropped 32 per cent on average between 1992 and 2014 (the period for which long-term consistent provincial population-count data is available), based on 117 monitored populations of 34 species (Figure 9).

Lake trout, lake whitefish, and the American eel are among the species facing the greatest declines.³⁴ Data suggest that the drop in Lake Ontario fish numbers became steeper in the mid to late 1990s — a period that corresponds with the invasion of round goby, an aggressive bottom-dwelling fish brought to Canada from Eastern Europe in ship ballast water.

Figure 9. The LPI shows a decline of 32 per cent (range: 9 to -57 per cent) between 1992 and 2014.

Trend in population abundance for 117 monitored populations of 34 Lake Ontario fish species (WWF-Canada, 2017).



Lake whitefish

For decades, silvery lake whitefish — up to half a metre long or more — were among the most numerous of large deepwater fish throughout the Great Lakes, and a mainstay of commercial fishing. However, commercial fishing combined with phosphorus pollution from farm fertilizers and household soaps dramatically reduced Lake Ontario populations of lake whitefish. By the early 1970s in Lake Ontario, lake whitefish stocks were in trouble.³⁵

Reduction strategies introduced by the Ontario government led to the reduction of phosphorus pollution, and biologists addressed other problems with a view to restoring the lake's ecosystem.³⁶ In the late 1980s, lake whitefish and other species rebounded. Lake whitefish in Lake Ontario were celebrated as a rare fisheries-management success story.

Invasive mussels arrived in 1989.³⁷ Zebra and quagga mussels — likely brought from the Black Sea region of Eurasia, in transoceanic ships' ballast water — found a foothold in the lake and established themselves as Canada's best-known invasive species. Quickly, the invasive mussels spread throughout the Great Lakes and to other inland lakes, transforming entire ecosystems. Zebra mussels filter organic matter that would otherwise be food for *Diporeia hoyi*. The population of these tiny shrimp-like crustaceans, whose key predator is lake whitefish, declined significantly.³⁵ Consequently, lake whitefish in Lake Ontario also declined, with matters compounded by the increasing ice-free winters that affect their reproductive success. Lake whitefish remain at a very low abundance level,³⁸ the Lake Ontario population has not been assessed by COSEWIC.



MARINE

Monitored populations of marine fish, birds, mammals and a reptile (the leatherback sea turtle), which live in the ocean or along Canada's 243,000 kilometres of coast, dropped on average by nine per cent overall between 1970 and 2014 (based on data from 2,313 monitored populations of 367 vertebrate marine species, of which 79 per cent are fish and 14 per cent are birds) (Figures 10a & 10b). A closer examination of the trend reveals that marine species populations tended to increase in the 1970s, then decline, with trends varying among wildlife groups. Overall, fish populations declined after 1975, while bird populations increased.

Marine Living Planet Index

Figure 10a. The LPI shows a decline of 9 per cent (range: 5 to -21 per cent) between 1970 and 2014. Trend in population abundance for 2,313 monitored populations of 367 marine vertebrate species (WWF-Canada, 2017).

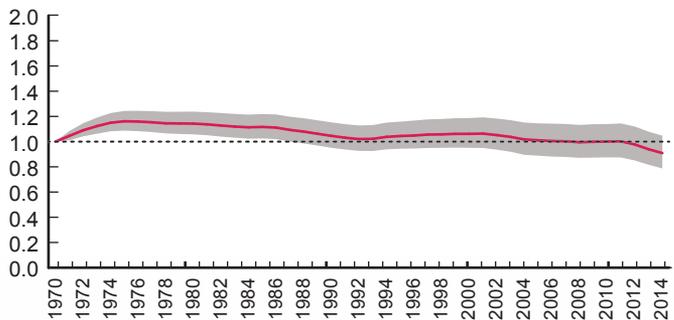
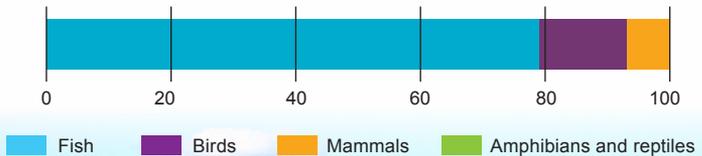


Figure 10b. Relative proportion of major species groups included in the LPI (367 vertebrate species)



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TERRESTRIAL

Monitored populations of terrestrial species have fallen on average by nine per cent since 1970 (based upon 784 monitored populations of 334 species) (Figure 11a). The largest drop in these populations occurred in the early 1970s, and they have remained somewhat stable since then. Many of the terrestrial species in this study are birds (73 per cent), followed by mammals (23 per cent) and reptiles (four per cent) (Figure 11b).

Terrestrial Living Planet Index

Figure 11a. The LPI shows a decline of 9 per cent (range: -1 to -16 per cent) between 1970 and 2014.
Trend in population abundance for 784 monitored populations of 334 terrestrial vertebrate species (WWF-Canada, 2017).

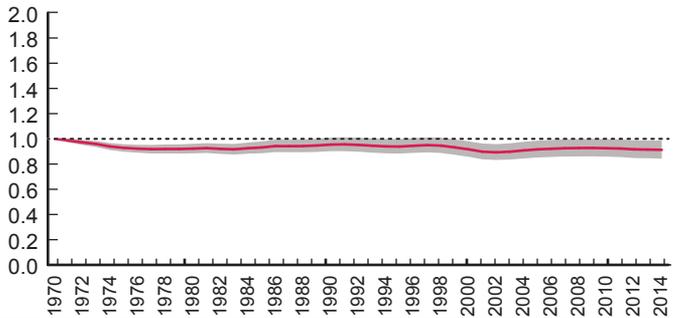
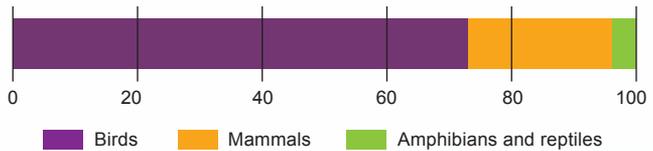


Figure 11b. Relative proportion of major species groups included in the LPI (334 vertebrate species)



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Swift fox

This delicate, cat-size fox was once at home in grasslands throughout Canada's southern prairies, of which 80 per cent³⁹ has now been converted for intensive agricultural use. Along with losing habitat, swift foxes were also caught in traps and died by poisoning as land-owners sought to exterminate other wildlife. The last sighting of a wild swift fox in Canada was in 1938.⁴⁰

In 1973, swift foxes were brought from the U.S. for a captive breeding program, and the painstaking effort of reintroducing swift fox into the wild began 10 years later. (Captive breeding is not always successful: One-third of species reintroduction efforts fail.)⁴¹ The process was complex and costly, and many of the released foxes died.

Yet, after being declared extirpated from Canada in 1978, the swift fox population had grown to 647 by 2009⁴² and its status moved from Endangered to Threatened under SARA in 2012. Scientists believe small populations are producing their own young in Saskatchewan and southern Alberta. However, the current population of swift fox only occupies three per cent of its former range.

Incidentally, efforts to restore grassland habitat to increase chances of success for the swift fox are also aiding other stressed species, such as the burrowing owl, greater sage grouse and black-footed ferret.



WILDLIFE SPOTLIGHT

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WILDLIFE BY SPECIES GROUP

Canada is home to approximately 200 mammal species, including blue whales longer than two school buses and tiny pygmy shrews no heavier than a nickel. As symbols of vast wilderness and expanse, mammals are, perhaps, most emblematic of wildlife. According to the index, between 1970 and 2014, mammal populations shrank on average by 43 per cent.

From hummingbirds to soaring hawks, birds are the wildlife Canadians are likely to see day to day. Approximately 450 bird species are regularly occurring in Canada. Of those, only 22 per cent stay year-round within our borders.⁴³ The others migrate, often many thousands of kilometres. The LPI shows overall that two bird groups are increasing, while three groups are declining.

At nearly 1,050 species, Canada's fish species are the most diverse of our vertebrate groups. Tens of thousands of Canadians make their living directly from fishing and fishing-related activities. Despite their importance, fish populations — particularly those in marine environments in Canada — are shrinking, according to the Living Planet Index.

There are approximately 90 species of amphibians and reptiles across Canada, from chorus frogs that herald spring in wetlands to painted turtles that bask on logs. Amphibian and reptile numbers are declining, according to the Living Planet Index.



MAMMALS

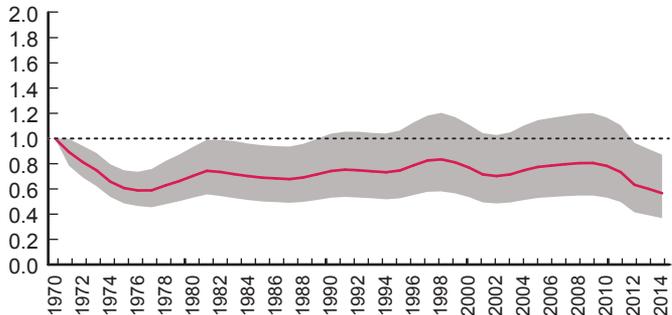
According to the Living Planet Index, monitored mammal populations shrank by 43 per cent, on average, between 1970 and 2014 (based on 549 monitored populations of 106 species) (Figure 12).

Some terrestrial mammals, such as bats and woodland and barren-ground caribou, show an even more precipitous drop.

Several Canadian whale species have seen populations bounce back since the baseline year of 1970, thanks in part to the 1972 global and federal ban on commercial whaling. Yet studies have shown that the already Endangered southern resident orcas (killer whales) in British Columbia have declined since 1995,⁴⁴ and in the east North Atlantic right whales and the St. Lawrence beluga whales remain Endangered.

Mammal Living Planet Index

Figure 12. The LPI shows a decline of 43 per cent (range: -13 to -63 per cent) between 1970 and 2014.
Trend in population abundance for 549 monitored populations of 106 mammal species (WWF-Canada, 2017).



St. Lawrence beluga

Chalk white, with a bulbous “melon” on its forehead, the playful beluga of the St. Lawrence estuary is the most southerly whale of its kind. Because it was a prime source of oil, whalers and hunters harvested it in huge numbers. In the 1920s, when cod stocks suddenly declined, fishermen blamed the St. Lawrence belugas. In 1928, the Quebec government handed out rifles and offered a \$15 bounty for each beluga killed. Soon after, Quebec authorized aerial bombing of beluga for a few years.^{45,46,47} By the late 1970s, the population of St. Lawrence belugas had dropped to a tenth of its historical estimated population size; a hunting ban was implemented in 1979.⁴⁸

Though the St. Lawrence beluga was SARA-listed as Threatened in 2005, a recovery strategy — including a plan to protect vital summer habitat — was repeatedly

delayed past the 2007 deadline. It wasn't until 2012, when the St. Lawrence beluga population was estimated to still be hovering at approximately 900 whales, that critical habitat was finally identified and the recovery strategy was published. Legal protection of the area, however, was delayed until 2016 — almost four years past the date required by law. The St. Lawrence beluga was uplisted to Endangered in 2017.

A safe, disturbance-free habitat is essential to the whales, which continue to suffer from contaminants in the food chain, prey-fish availability, entanglement in fishing gear, the effects of climate change, shipping activity and disease.⁴⁸ Belugas, their prey and their habitat all have elevated levels of contaminants — highlighting the impact of toxic chemical bioaccumulation in the St. Lawrence River on wildlife.

BIRDS

The state of Canada’s birds is varied, according to the Living Planet Index. Overall, bird populations increased on average by seven per cent between 1970 and 2014 (based on data from 474 monitored populations of 386 bird species) (Figure 13). But some separate bird groups — grassland birds, shorebirds, ducks and geese, hawks and owls — show widely differing trends.

For instance, populations of grassland birds have seen their numbers plunge on average by 69 per cent since 1970 (based on data from 26 monitored populations across 26 species), according to the Living Planet Index. Further, populations of aerial insectivores in Canada, such as swifts and swallows, fell on average by more than 51 per cent since 1970 (based on data from 27 monitored populations representing 27 species). Shorebird populations in Canada declined on average 43 per cent since 1970 (based on data from 40 monitored populations representing 37 species). These results are consistent with *The State of Canada’s Birds* (2012).⁴³

Bird Living Planet Index

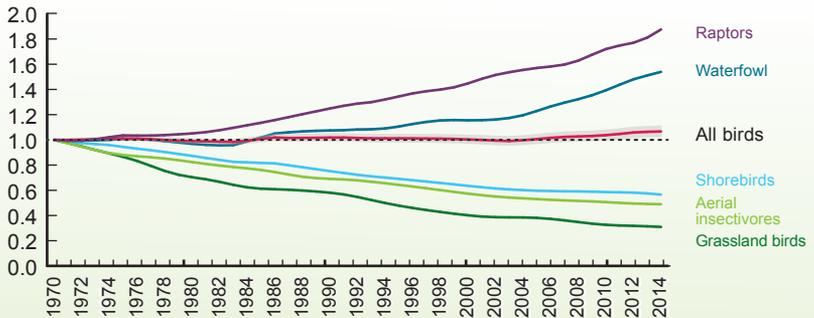


Figure 13. The LPI shows an increase of 7 per cent (range: 2 to 11 per cent) for all birds between 1970 and 2014.

Trend in population abundance for 474 monitored populations of 386 bird species (WWF-Canada, 2017). The LPI shows an increase for raptors (88 per cent) and waterfowl (54 per cent), and a decrease for shorebirds (-43 per cent), aerial insectivores (-51 per cent), and grassland birds (-69 per cent).





Canada warbler

Males of this small warbler species are recognizable by their bright yellow breast and distinctive necklace of dark streaks. Its rich, clear song is a declaration of summer's fast approach. Most of the world's Canada warblers breed here, usually nesting low to the ground in shrubby, wet and lush mixed woods. In winter, these forest songbirds travel to the faraway rainforests of South America.

Throughout its wide range across the country, the Canada warbler's habitat is shrinking. In southeastern Canada, large areas of swampy woods have been drained

for conversion to agriculture or for expanding cities. Meanwhile, 95 per cent of the mature cloud rainforests where the birds winter in the Andes have been cleared for farming since 1970. The result of this double loss of habitat has been a 70 per cent drop in Canada warbler populations in Canada, between 1970 and 2012,⁴⁹ most evident in Ontario, Quebec and the Maritimes, where the majority of the population nests. It was last assessed by COSEWIC in 2008, and listed as Threatened under SARA in 2010.

A CLOSER LOOK AT BIRDS

Grassland birds

Grassland birds, such as meadowlarks, bobolinks, vesper sparrows and many others, live and nest in grassy prairies, meadows and other grassy fields. Natural prairie grassland is considered the most heavily degraded terrestrial habitat in the world.⁵⁰

Aerial insectivores

Birds that eat insects on the wing include our most spectacular flyers, such as barn swallows, chimney swifts, nighthawks and others. Aerial insectivores are in decline. Biologists have proposed a number of theories to explain this, and suggest that climate change,⁵¹ morphing insect populations,⁵² habitat fragmentation and pesticide use⁵³ may be contributing factors.

Shorebirds

Shorebirds include sandpipers, plovers, curlews and others usually seen busily running along beaches or picking through mudflats. Among Canada's longest-distance migrants, these birds are affected by habitat loss on their migratory routes and in wintering areas in nations as far south as Argentina.

Waterfowl

One of the most heavily hunted bird groups, waterfowl such as ducks and geese appear to be improving overall. According to the Living Planet Index, waterfowl populations have increased, on average, by 54 per cent since 1970 (based on data from 66 monitored populations representing 38 species). Improved international co-operation for range-wide management (through the North America Waterfowl Management Plan and implementation of the Migratory Birds Convention Act) as well as wetland conservation driven by conservation groups and government programs have together bolstered the protection for many waterfowl species.

Raptors

According to the national Living Planet Index, species in this bird group — including Cooper's hawks and peregrine falcons — have seen their numbers swell by 88 per cent, on average, since 1970 (based on data from 29 monitored populations representing 20 species). This dramatic, nationwide recovery follows significantly reduced use and even elimination of some detrimental pesticides, especially DDT which caused severe eggshell thinning and breakage.





Piping plover

The piping plover — a diminutive, busy and beautiful shorebird — is a master of camouflage. The bird's pale brown, grey and white feathers make it hard to spot as it forages along retreating waves or nests at the back of wide beaches. The piping plover loves the same sunny beaches and sandy waterfronts that people enjoy. When beachgoers and their pets disturb the plovers' nests, the wary birds then abandon them. More humans on beaches, more waterfront cottages and other landscape alterations have battered the plover's populations in Canada, especially along the Great Lakes, and in its wintering grounds along the Atlantic coast of South Carolina to the Gulf of Mexico. For those whose range is in the prairies, agriculture is a stressor.

One-third of the global breeding population is found in Canada, but their numbers have

dropped by more than a quarter since 1970. The piping plover was listed by SARA as Endangered in 2003. The recovery strategy was finalized in October 2006. However, in recent years, piping plovers have returned to the Great Lakes to breed, albeit in small numbers (they were extirpated there as a breeding species).

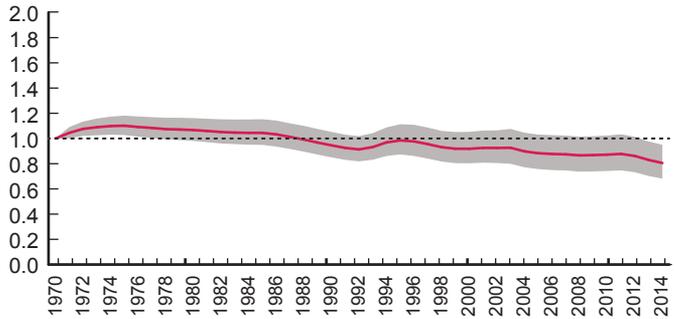
Before the plover came under the federal program, however, conservation efforts to rescue and recover the species — including rearing abandoned eggs — were already underway.⁵⁴ The education of land owners and beachgoers, as well as the introduction of programs to protect nests and young with cage-like predator enclosures, are offsetting some of the population declines caused by disturbed habitat. The piping plover has become conservation-dependent.

FISH

The Living Planet Index shows fish populations have dropped 20 per cent on average between 1970 and 2014 (based on data from 2,527 monitored populations of 365 fish species) (Figure 14). Along with more commonly known commercial species, this fish group includes sharks, skates and rays. Given that most of the records included in the dataset are from Canada's East Coast, Atlantic marine fish are most responsible for the observed trend. Less is known about Canada's approximately 180 species of freshwater fishes due to a lack of monitoring and available information about their populations.

Figure 14. The LPI shows a decline of 20 per cent (range: -5 to -32 per cent) between 1970 and 2014. Trend in population abundance for 2,527 monitored populations of 365 fish species (WWF-Canada, 2017).

Fish Living Planet Index



Lake sturgeon

In the murky shallows of Canada's large lakes and rivers, enormous lake sturgeon — which have a lifespan of 100 years — scour the bottom for insect larvae, snails and crayfish. Graceful and shark-like, with a body covered in large bony plates, the country's largest freshwater fish appears to belong to another age. Close ancestors to sturgeon were swimming the world's waters before birds flew or modern mammals even existed. They swam through the extinction of the dinosaurs and, for 200 million years, have overcome every threat — until now.

After decades of historical commercial overfishing, as well as dam building (especially for large-scale hydro projects) on rivers in which lake sturgeon breed, lake sturgeon — one of five sturgeon species found in Canadian waters — have declined.

In some parts of their range, sturgeon have disappeared. Once measured at three metres in length, they are rarely recorded over 1.5 metres any more.⁵⁵ They are slow breeders: Female lake sturgeon spawn once every four to six years, while males spawn every two to seven years.⁵⁵

Eight populations were assessed by COSEWIC as at risk in 2007, including Endangered populations in Nelson River and Western Hudson Bay. The recommendation for listing these populations was put to consultation, which extended until 2012. As of summer 2017, a listing decision had not been made, and lake sturgeon were without SARA protections. A recent study suggests their economic value for commercial harvesting may be delaying a SARA decision.²⁷



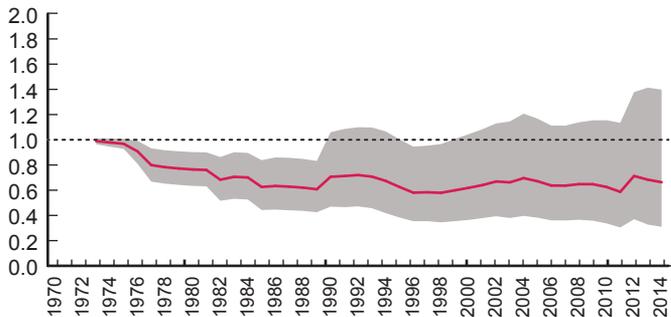
AMPHIBIANS AND REPTILES

According to the Living Planet Index, amphibian and reptile populations declined by 34 per cent on average between 1970 and 2014 (based on data from 139 monitored populations of 46 species) (Figure 15). While there's a comparatively high degree of variation in this trend over time (the range is 40 to minus 69 per cent), the decline in this group of species is well documented both in Canada,^{3,56} and around the world.⁵⁷ In Canada, 42 per cent of amphibians and 77 per cent of reptile species were COSEWIC-assessed as at-risk as of 2014.⁵⁶

Salamanders, frogs, snakes and turtles are important to diverse ecosystems as predators that eat pests like mosquitoes and ticks. Snapping turtles, for one, eat carrion, keeping freshwater clean. Frogs and salamanders also move essential nutrients into the forest from enriched pools and ponds, where they spend part of their lives. Snakes are important to keeping rodent populations in balance.

Amphibians and reptiles Living Planet Index

Figure 15. The LPI shows a decline of 34 per cent (range: 40 to -69 per cent) between 1970 and 2014.
Trend in population abundance for 139 monitored populations of 46 amphibian and reptile species (WWF-Canada, 2017).





Snapping turtle

Floating at the water's surface with a mossy grey shell and a great, dark head raised to survey the world, the snapping turtle looks prehistoric. Canada's largest freshwater turtle is found prowling for insects, plants or small fish in ponds or shallow bays in mainland Nova Scotia, southern New Brunswick, southern and central Quebec, southern and central Ontario, southern Manitoba and southeastern Saskatchewan. Decaying plants and animals make up a significant portion of their diet, highlighting the role that snapping turtles play keeping lakes and wetlands clean.

While turtles have been on Earth for more than 200 million years, freshwater turtles are now among the most endangered vertebrates on the planet. Snapping turtles, which can live for more than a century, are especially

vulnerable. The turtles take up to 20 years to reach breeding age. That means the loss of even one turtle can have a big impact on the population. While population trends for the species are not currently known nationwide, long-term studies in Ontario show that even slight increases in the numbers of adults killed can affect apparently secure populations.⁵⁸ They do not recover quickly.

The snapping turtle is currently listed as a species of Special Concern under the federal Species at Risk Act. Threats include habitat loss, degradation and road mortality from a growing network of busy roadways where mature females are often killed as they cross in search of well-drained sandy soil to lay their eggs.

WILDLIFE TRENDS ACROSS CANADA

As the second-largest country in the world, Canada is home to a remarkable diversity of landscapes and ecosystems, each with their own wildlife trends or concerns. Five distinct regions — the Pacific, Prairie, Central, Atlantic and Arctic regions — feature characteristic geography, climates, plants and animals. As such, the regional analyses of the Living Planet Index focus on wildlife groups that are characteristic of each region. The population trends that follow are those for which wildlife decline is most evident, and therefore of greatest conservation concern. In the Pacific, we look more closely at freshwater species; in the Prairies, grassland birds; amphibians and reptiles in Central Canada; and marine fish in the Atlantic. The Arctic poses unique challenges with inconclusive index findings.



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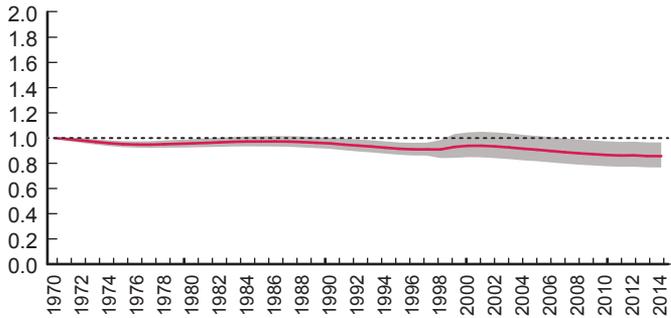


PACIFIC REGION

British Columbia, with towering mountains, extensive forests (including temperate rainforest), mighty rivers and sprawling coastline, is geographically spectacular. For this region, the Living Planet Index reveals that monitored populations of birds, mammals, fish, amphibians and reptiles that live in or depend on freshwater ecosystems have declined by 14 per cent on average since 1970 (based on data from 140 monitored populations of 68 vertebrate species) (Figure 16).

Pacific freshwater Living Planet Index

Figure 16. The LPI shows a decline of 14 per cent (range: -3 to -23 per cent) between 1970 and 2014.
Trend in population abundance for 140 monitored populations of 68 Pacific freshwater vertebrate species (WWF-Canada, 2017).



Along with habitat loss and fragmentation and pollution, the changing climate has impacted the region's freshwater ecosystems, through low water levels from evaporation, higher water temperatures, the accelerated melting of mountain glaciers and resulting changes in flow. Fish and other freshwater species are especially affected. Climate-change-induced warming of rivers is impeding sockeye salmon migration⁵⁹ and making the salmon more susceptible to mortality⁶⁰ – which has cascading effects on the ecosystem and dependent wildlife like the grizzly bear, which rely on salmon as key source of food.⁶¹



Chinook salmon & southern resident killer whales

On Canada's West Coast, glacier-fed rivers flow from the mountains to mix with the salty Pacific below. The connection between marine and freshwater wildlife is strong: Threats to one ecological realm can have devastating impacts on the other.

Chinook salmon bridge the worlds of river and sea. The largest of the Pacific salmon species, chinook are born in cool, freshwater inland streams and leave for the open ocean before returning to their birthplace again — sometimes as much as 1,500 kilometres upstream — to spawn. Southern resident killer whales, also known as orcas, meanwhile, distinguish themselves from most other orca populations by feeding near-exclusively on chinook. The magnificent black-and-white predators hunt preferentially for the big, fatty salmon species — even when far more pink or sockeye salmon are available.

That's a problem. Chinook salmon populations have declined drastically over the last century.⁶² As early as the late 19th century, the formerly teeming chinook salmon runs in the Okanagan River and elsewhere in the Columbia River system were decimated⁶² by commercial fishing. More recently, growing numbers of hydroelectric dams and reservoirs have created deadly river barriers for returning adults and especially for their young heading out to sea. Many chinook stocks are now a small percentage of their historic levels, and more than 50 stocks are now extinct.⁶³ In 2005, COSEWIC declared the chinook salmon that spawn in the Okanagan River system to be Endangered.

The southern resident killer whale population, meanwhile, has earned the same Endangered designation in both Canada, under SARA, and the United States.

Between 1995 and 2017, the number of southern resident killer whales has fluctuated from a high of 98 individuals to a precarious low of just 78 (as of July, 2017).⁶⁴ Because of the orca's low reproductive rate, the small number heightens the risk of it vanishing altogether. Key drivers behind the decline of this population are declining availability of their preferred food (chinook salmon), toxins in food, and increasing underwater noise and disturbance from marine traffic that interferes with orcas' use of sound to communicate, sense their environment and find prey.

According to researchers, falling numbers of chinook due to fishing, dams, increasing ocean and stream temperatures and stream habitat loss — often hundreds of kilometres from the ocean home of the orcas — have had a corresponding impact on the southern resident killer whales. The group's specialized preference for this one

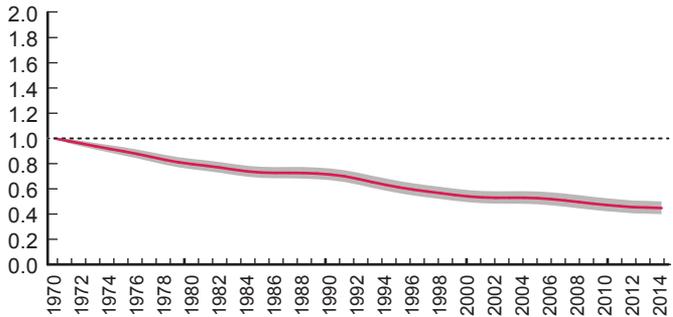
salmon means the fortunes of both species are linked. In particular, scientists say that orcas may be starving because there are far fewer chinook in recent years. The result is nutritional stress, making southern resident killer whales vulnerable to disease or to the effects of the pollution accumulated from a diet of contaminated prey. A June 2017 study suggests orca pregnancies are affected by the salmon shortfall, too. The research shows that up to 69 per cent of all detectable pregnancies between 2008 and 2014 were unsuccessful; of these, up to 33 per cent failed due to nutritional stress relatively late in gestation or immediately after birth, when the cost to the females is high.⁶⁵

PRAIRIE REGION

In Canada, the prairie region stretches across the expanses of Manitoba, Saskatchewan and Alberta, and is home to fertile farmlands, as well as once-vast tracts of wildlife-rich, biologically distinctive native grasslands. Birds such as McCown's longspur, greater sage grouse, burrowing owl and many others are uniquely adapted for the dry, grassy open landscape. But in the prairie region, according to the Living Planet Index, monitored grassland bird populations dropped by 55 per cent, on average, from 1970 to 2014 (based on data from 62 monitored populations of 23 grassland bird species) (Figure 17).

Prairie grassland bird Living Planet Index

Figure 17. The LPI shows a decline of 55 per cent (range: -50 to -60 per cent) between 1970 and 2014. Trend in population abundance for 62 monitored populations of 23 prairie grassland birds (WWF-Canada, 2017).



The most significant threat to the region's wildlife is habitat loss, as the grasslands have been converted into agricultural fields or divided by other development. In Canada, less than 20 per cent of native grassland habitats remain, mainly in southeastern Alberta and southwestern Saskatchewan, with fragments distributed throughout southern Manitoba³⁹



WILDLIFE SPOTLIGHT



Bobolink

Bobolinks were once a common sight in meadows, pasturelands and plains across much of southern Canada. The sparrow-like bird — whose males have a distinctively jet-black front, a lighter back and a buff-coloured mark on the neck and head — could be seen bursting from field grass in sudden, singing flight. Scientists say the bobolink population across the country has shrunk by 88 per cent in the past 40 years, and in the decade between 1998 and 2008 alone, population numbers fell by 38 per cent.⁶⁶ The worst of the population declines occurred in eastern Canada.

According to researchers, widespread loss and deterioration of grassland habitat is responsible. Areas of prairie and other grazing lands are being lost to expanding urban areas. Although bobolinks originally

benefitted from the conversion of forest to agriculture, the modernization and intensification of farming operations, both in Canada and in the bobolink's wintering grounds in South America, are further driving declines. With earlier hay harvests, ground-nesting bobolinks in hay fields often lose their eggs or young to mowing before the birds can fledge. Bobolink young killed by these mechanical farm operations in Canada are estimated at 667,000 each year, based on a 2013 study.⁶⁷

The use of pesticides is also a serious threat, affecting bird health and breeding success. Bobolinks were declared Threatened by COSEWIC in 2010. In 2017, a SARA listing was proposed for this species as Threatened under Schedule 1.⁶⁸

CENTRAL REGION

Close to two-thirds of all Canadians (more than 22 million) live in Quebec and Ontario. Many of our largest cities and economies dot the region's southernmost edge, along the shores of the Great Lakes and St. Lawrence River, where most of the region's reptiles and amphibians live.

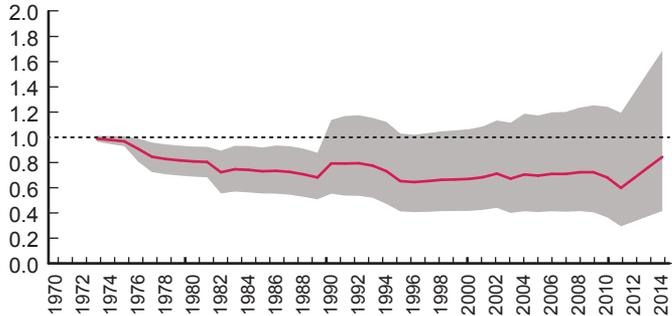
According to the Living Planet Index, monitored populations of snakes, turtles, lizards, frogs, and salamanders — vital to the region's woodland and wetland ecosystems — declined by 16 per cent on average between 1970 and 2014 (based on data from 73 monitored populations of 28 species) (Figure 18). In part, due to small sample size, there is large variance for this index, including range from 69 to minus 59 per cent. However, this finding is supported by recent studies that also found average decline in amphibian and reptile populations in the central region.^{69,70}

Habitat loss, in combination with fragmentation, road mortality and pollution are some of the major threats to wildlife in the region.³

Central Canada amphibians and reptiles Living Planet Index

Figure 18. The LPI shows a decline of 16 per cent (range: 69 to -59 per cent) between 1970 and 2014.

Trend in population abundance for 73 monitored populations of 28 central amphibian and reptile species (WWF-Canada, 2017).



Jefferson salamander

Salamanders are the unsung heroes of Canada's forest ecosystems. Usually hidden under woodland rocks and old logs, these small, slender amphibians serve as important predators that eat mosquito larvae (as young) and ticks. The eight members of this amphibian group that live in Canada are also vital ecological conduits, moving nutrients into the forest from enriched ponds where they typically spend part of their lives.

The comparatively large and sleek Jefferson salamander — which lives in small, isolated populations in the Carolinian woods and along the Niagara Escarpment of southwestern Ontario — was uplisted from Threatened to Endangered under SARA in the spring of 2017. Road mortality is a major threat, as salamanders cross from woods to wetlands to breed in spring. Concerned Canadians have stepped forward to help.

Each spring for the past five years, for instance, the city of Burlington, Ont., has closed nearly a kilometre of road for three weeks to allow the salamanders to cross unharmed to their breeding ponds.⁷¹

While other municipalities are doing their part, the ongoing pressure from endless expansion, which is modifying landscape through roads and other barriers to migration, is restricting the species' range in these highly populated areas. The salamander's shrinking habitat — usually fishless, springtime pools and undisturbed upland forest — is critical to the species' survival. Most of the historical sites where the species were still being found in 1990 and 1991 had no populations of the salamander remaining by 2003 and 2004, according to studies conducted then.⁷²

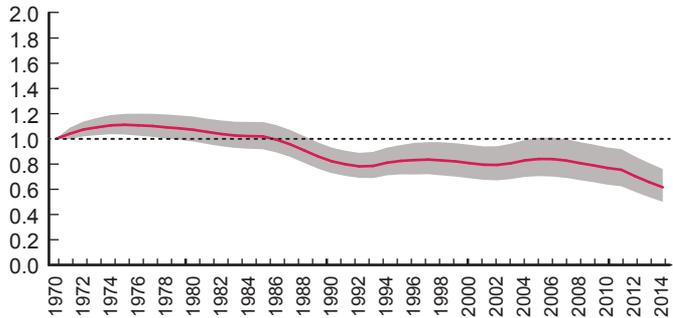
ATLANTIC REGION

Nova Scotia, Newfoundland and Labrador, New Brunswick, Prince Edward Island and the marine waters extending out to Canada's Exclusive Economic Zone make up the Atlantic region. According to the Living Planet Index, from 1970 to 2014, monitored marine fish populations along Canada's Atlantic coast dropped by 38 per cent on average (based on data from 2,224 monitored populations of 139 fishes within national boundaries) (Figure 19).

Atlantic marine fish Living Planet Index

Figure 19. The LPI shows a decline of 38 per cent (range: -24 to -50 per cent) between 1970 and 2014.

Trend in population abundance for 2,224 monitored populations of 139 Atlantic marine fish species (WWF-Canada, 2017).



Overexploitation and climate change are notable threats. Ocean surface temperatures have warmed in the Northwestern Atlantic Shelf, and the number and types of species in Canadian waters are expected to change as southern species shift north.⁷³ Ocean acidification, driven by climate change, can impact fish⁷⁴ and limit their ability to survive, particularly during early life stages.⁷⁵



Atlantic bluefin tuna

Sleek and torpedo-like, the Atlantic bluefin tuna can power through the sea at speeds of up to 40 kilometres an hour and cross the Atlantic in less than a month.

There are two distinct populations — one that spawns in the Mediterranean (eastern) and one that spawns in the Gulf of Mexico (western). It is mainly this western population that migrates to summer feeding grounds in Canadian waters, then south during the winter back to the Gulf.

The bluefin can grow the length of a small car and weigh more than a grand piano. As such, it is the catch of a lucrative commercial fishery in which a single tuna once sold for almost \$1.5 million (U.S.) in Japan.⁷⁶ Numbers of mature western Atlantic bluefin tuna have dropped by approximately 75 per cent from 1970 to 2010.⁷⁷ In Canada, the western population of Atlantic bluefin tuna was designated by COSEWIC as Endangered in 2011.

Recovery of bluefin populations has been led by the International Commission for the Conservation of Atlantic Tunas (ICCAT), which adopted a 20-year rebuilding plan for the western stock in 1999. In 2014, ICCAT reassessed the bluefin tuna stock and reported the spawning stock biomass had begun to recover, up to 55 per cent of 1970 levels of abundance.

In 2017, the Government of Canada decided not to list the western population of bluefin tuna under SARA,⁷⁸ in part due to ICCAT's finding of increasing stock number, as well as in response to concerns of key stakeholders about the potential socioeconomic impacts of a fisheries closure. Instead, recovery of the species will be managed under the DFO-led Integrated Fisheries Management Plan process as guided by ICCAT's allotment of total allowable catch.



ARCTIC REGION

The Arctic region extends throughout Nunavut, Northwest Territories and Yukon, and is home to a large variety of wildlife, including many globally significant populations and 43 SARA-designated vertebrate species.

Scientists in the Arctic have successfully documented wildlife populations in an area that is unduly difficult to study. An impressive 224 species from 639 records were collected within the Canadian territories, most of which were birds.

However, despite the large amount of data, scientific experts deemed all of the sub-indices inconclusive, in large part because significant population increases of birds and especially waterfowl (which are heavily represented) skew trends upwards, thereby masking other important wildlife trends. Further, there is poor data availability on population abundance from 1970 to 1975. The lack of data in this timeframe hampers the ability to create an accurate LPI using a baseline of 1970. It is for these reasons that many of the sub-indices calculated for the Arctic region are not congruent with current scientific understanding, and are therefore reported as inconclusive.

We do know the region has undergone significant change since 1970. Warming air and ocean temperatures are rapidly shrinking sea ice extent, by 13.3 per cent per decade relative to the 1981-2010 September minimum sea ice average.⁷⁹ (The lowest-ever satellite record of maximum winter sea ice was reported in 2017.) On land, early winter rainfall and increasing freeze-thaw events, in which snow melts and then refreezes as ice, result in an icy barrier to vegetation that barren-ground caribou rely on for survival. The melting of sea ice and permafrost opens the door to more industrial development, which will result in more overland transportation and an increase in shipping — which will probably lead to further habitat loss and fragmentation, and disturbance to sensitive wildlife populations. Noise pollution, fuel spill risks and interference from large freighters and cruise ships threaten marine mammals and fish, and their habitats.





Narwhal

The narwhal is a highly specialized whale living in Canada's Far North, renowned for its long, spiral ivory tusk. The tusk (a protruding left upper canine tooth) is found mostly in males, extending from the narwhal's head. Living in the remote icy waters of the Arctic, the narwhal has eluded much of the scientific scrutiny that has revealed the lives and habits of more southerly whales. During the summer, Canada is home to 90 per cent of the global narwhal population. In the winter, narwhal disappear for months into the deepest areas of Baffin Bay and Davis Strait, diving up to 1,500 metres to feed on Greenland halibut, and surfacing to breathe through small openings in the sea-ice. Only recently have researchers begun to piece together vital information about the animal's

behaviour, its susceptibility to ship and other industrial noise, and preferred habitats.

Studies have revealed that the narwhal is so uniquely adapted to life with ice that it is the most vulnerable of all Arctic marine mammals to the threats posed by climate change.⁸⁰ The shrinking Arctic sea ice is already having an impact. Orcas venturing north find the increasingly ice-free waters suitable for hunting, and seek narwhal as prey.⁸¹ What remains poorly understood is how narwhal populations fare in the face of these stresses. Only recently surveys have become more accurate. In 2004, narwhal were assessed as Special Concern by COSEWIC. Ongoing monitoring is necessary to determine long-term trends in abundance to achieve certainty about the status of populations.



WILDLIFE SPOTLIGHT



Barren-ground caribou

Across the windswept expanse of Canada's Arctic, the migration of thousands of caribou is a magnificent sight, the bulls crowned with large, sweeping antlers. Barren-ground caribou herds once spread in impressive numbers across the north, inhabiting terrestrial landscapes predominantly within Nunavut and the Northwest Territories. Many of the more than a dozen major caribou herds graze and travel across enormous stretches of tundra, in spring and summer, commanding vast areas of the Arctic as their home. Their journeys often take them between the wintering grounds of the northern boreal forest and traditional tundra calving grounds, where generation after generation from the same herd return to have their young. Grasses, mosses, sedges, willows, flowers and lichens make up most of the caribou diet.

For northern Indigenous people, barren-ground caribou, which are members of the deer family, are a traditional source of food and clothing. They are also an essential and age-old part of cultural and spiritual traditions. And for millennia, Indigenous hunters have understood that caribou numbers fluctuate. At times — for instance, during the 1950s — the herds have been small, but then recovered on their own. These days, however, fluctuations to barren-ground caribou populations are troubling. More than two million caribou ranged across their territory in the early 1990s, but the population total is now estimated to be less than half that figure (about 800,000).

Dramatic declines have been reported for most herds — several of the largest have shrunk by more than 90 per cent from their peak numbers.⁸² In 2016, COSEWIC (In Press)⁸² assessed the barren-ground caribou as Threatened.

What concerns scientists and local peoples is the newly altered northern landscape. Climate change is warming the Far North faster than anywhere else in the world.⁸³ The higher temperatures bring more autumn rains, and the rains freeze to ground-glazing ice, preventing the caribou from reaching the lichen and plants they need to survive.⁸⁴ Many likely starve or weaken. Shrinking sea ice is also affecting migration routes of one population.⁸⁴

At the same time, the altered climate is creating opportunities for industry — mining, tourism and shipping, among others. This development presents new threats to the caribou: disturbance of calving grounds or disruption of migration corridors. Managing the harvest becomes difficult when herd numbers are dangerously low. For barren-ground caribou, the cumulative threats to its Arctic home are adding up, increasing the vulnerability of caribou populations.

The Government of Nunavut — Canada's most northerly territory, home to most of the barren-ground caribou calving grounds — is developing a new, overarching land-use plan that will set a path for development and conservation in the territory.



STOPPING WILDLIFE LOSS

We...need to do more to preserve wildlife and their habitats so they are not in a position of becoming at risk of extinction in the first place.

WWF-Canada's national study of vertebrate species shows a clear trend: Half of the species included in the index have experienced population decline since 1970, and of those, the average decline was 83 per cent. The results also suggest that once species are set on a declining trajectory, it's incredibly difficult to reverse the trend. Even following the enactment of SARA, populations of listed, at-risk species continued to decline. Clearly we, as a society — government, industry, all of us, collectively — need to do more to preserve wildlife and their habitats so they are not in a position of becoming at risk of extinction in the first place. From a preventative standpoint, we need to do more to maintain healthy and sustainable populations in order to reduce our reliance on reactive recovery strategies that are complex, resource-intensive and have limited guarantee of success.

Scientists know that human action — from conversion of grasslands or forests for agriculture, discharge of pollutants that contaminate habitat and food chains, or from the impacts of climate change that disrupt ecosystem function — is driving the decline.⁸⁵ So what steps should we, as a society, take to reverse the trend?

The most powerful solutions to wildlife loss will rely on determining how human needs can be met without further overexploitation of species or degradation and destruction of their habitats. There is no one simple solution. This is a challenge we must all embrace. We need actions from all corners of society — from communities, industry, government, all of us, collectively. As a nation, to increase our chances of solving this problem together, we need to:

- Collect and share data on ecosystem health and species habitat.
- Increase research on the impacts of, and response to, climate change.
- Enhance SARA implementation and shift toward ecosystem-based action plans.
- Expand Canada's network of protected areas.
- Make a commitment to nature.



Preventing continued declines in wildlife species in Canada will require a systematically designed, and openly accessible monitoring system.

Collect and share data on ecosystem health and species habitat

Having baseline knowledge across the country is critical to understanding changes in species populations and the ecosystems they inhabit. (In simplest terms, you can't manage what you don't know.) This is especially critical as the climate changes. If we don't understand how habitats are changing and wildlife are adapting to current stressors, we won't be able to predict how they will respond to increased impact of climate change in the future.

This study identified a shortfall in wildlife population monitoring for certain systems — freshwater ecosystems, and the Arctic region, for example. As a result, as a nation we lack sufficient data to answer key questions about the status of wildlife and to track and evaluate trends over time. Preventing continued declines in wildlife species in Canada will require a systematically designed, and openly accessible monitoring system — with systematic sampling to ensure representation of regions, ecosystems and taxonomic groups — for tracking biodiversity across the country. This nation-wide monitoring system should also include Traditional Ecological Knowledge to engage all Canadians and further enhance our understanding of changes to wildlife populations and ecosystems.

Creation of this framework can be a collective undertaking involving communities, research institutions, environmental groups and governments. Canadians all across the nation can get involved — if the framework has standardized measures, indicators and standards.

In this way, citizen science can become a much more powerful tool in halting the decline of wildlife. A good example of a citizen science biodiversity program is the Canadian Aquatic Benthic Invertebrate Network (CABIN), a monitoring network managed by the federal Ministry of Environment and Climate Change Canada, and implemented by provincial and community groups using a standardized methodology for data collection, management and analysis.



Investment in monitoring of Canada's wildlife populations through new technologies like environmental DNA can help build the applicability and ease of implementation of citizen science in a standardized monitoring network. If citizen-science programs like these are replicated and applied to other wildlife in a systematic way, individuals and communities could become a driving force in collecting data in underrepresented geographic areas or for underrepresented species groups.

A stronger understanding of the status of wildlife populations will help inform future, evidence-based decisions related to their conservation. The findings of this research should be used to identify habitats in need of threat reduction, protection and actual restoration (for recovery of existing species at risk and to prevent movement of more wildlife onto the at-risk list in the first place). The findings will also point toward corresponding threat reduction, protection and restoration actions to be taken by government, industry, research institutions, communities and individuals.

Increase research on the impacts of, and response to, climate change

Knowledge is growing but still limited about exactly how climate change, and the associated build-up of atmospheric carbon, is contributing to species decline.

Robust data will contribute to a greater understanding of how species and ecosystems will respond to climate change, allowing us to build evidence-based strategies for mitigating climate change impacts and for enhancing ecosystem resilience. Research institutions, communities and government all have a role to play.

Robust data will contribute to a greater understanding of how species and ecosystems will respond to climate change.



Enhance SARA implementation and shift toward ecosystem-based action plans

By saving an ecosystem we can prevent the movement of individual species onto the at-risk list in the first place.

Single-species conservation is so resource-intensive it cannot be scaled for hundreds of species at risk. It's essential we take an ecosystems-based approach. By saving an ecosystem we can prevent the movement of individual species onto the at-risk list in the first place. And for those already at risk, research indicates that an ecosystem approach to recovery is more likely to improve SARA conservation outcomes, can benefit a wide range of at-risk species and ecosystem processes and contribute to potential savings.⁸⁶ For some species at risk, climate change is expected to worsen living conditions. If we develop recovery strategies and action plans without adequate information about the extent of future climate change impacts, they're unlikely to be as effective.

A more effective response is one that takes into account how multiple species (including predators and prey) and their habitats will shift as a consequence of climate change, and how disturbance regimes (patterns of floods, fire and drought that wildlife have adapted to over millennia) will be altered.

The opportunity to protect and promote the recovery of SARA-listed species could be vastly expanded if government implements mechanisms for financial incentives to individual landowners to protect (and restore) critical habitat on private land.

Finally, to maximize its intended objectives, the SARA process must have adequate funding of its core mechanisms (nearly 100 countries provide better funding to protect their species at risk),²⁸ and it must be implemented in a timely manner. In Canada, it has been recommended the federal government increase the budget for SARA-related programs by \$200 million over four years.⁸⁷



Expand Canada's network of protected areas

While protected areas — encompassing marine, freshwater and terrestrial ecosystems — can have recreational and cultural value for humans, their greatest value comes as intact ecological reserves for wildlife. These protected areas aren't just for species already at risk. Long-term persistence of wildlife species requires that we make sufficient space available to ensure their habitat remains intact, with core areas for critical activities like feeding and breeding free from disturbance from human activity, and spacious enough for movement like migration or dispersal.

This last requirement, the ability to move through a network of connected landscapes, is critical to enhance wildlife resilience in the face of ongoing climate change.

Along with providing habitats for stable and at-risk wildlife, protected areas have huge value as a source of study of natural systems. Protected areas provide important ecological benchmarks for tracking and evaluating changes in biological systems over time. This role is increasingly important in order to assess climate change in core marine, freshwater and terrestrial ecosystems without the complications of other human stressors — thereby reducing the number of factors that need to be considered when assessing change, and minimizing the degree of uncertainty, so we can better track the impacts of a changing climate on wildlife and intact ecosystems.

Dedicating more space for protection takes the willingness and concerted effort of individual community members, industry and government. Communities, in particular, can identify and organize to designate areas of ecological and cultural importance worthy of legal protection. A recent example is the Tallurutiup Imanga (Lancaster Sound), a 109,000-sq.-km. national marine conservation area at the eastern entrance to the Northwest Passage, identified and fought for by Inuit communities for decades. In the future, similar Indigenous and community-led protected areas will be critical for wildlife protection.

Dedicating more space for protection takes the willingness and concerted effort of individual community members, industry and government.



Make a commitment to nature

Overall, these solutions are far more likely to be realized with broad public support for difficult resource allocation and land-use decisions that have a goal of benefitting nature at their core. As ecosystems are put under increasing pressure, and as the bad news mounts, individuals can feel powerless to make a difference. That doesn't have to be the case. By helping to monitor wildlife, and protect and restore habitats, individual actions, collectively, will help reverse the decline of wildlife in Canada.

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Northern leopard frog

The northern leopard frog glistens green or brown with characteristic dark leopard spots. Rattling its snore-like mating call from a springtime pond or leaping through wet field grasses in summer, it is an essential part of the food web. It eats slugs, worms, insects, spiders and other prey, and is eaten by waterfowl, fish, toads, snakes and other predators.

As a species that lives in distinct habitat types throughout the year (well-oxygenated water bodies that do not freeze solid in winter; wetlands, where it breeds and spends up to three months as a tadpole; upland meadows and prairie grasses in summer),⁸⁸ the frog is a barometer of environmental health.⁸⁹ The northern leopard frog is sensitive to habitat shifts and the toxic

effects of chemical pollution.⁹⁰ More recently, an emerging fungal frog disease known as *chytridiomycosis* is potentially becoming a significant threat.⁸⁸ The disease has been blamed for dramatic declines and extinctions of more than 200 frog and amphibian species around the world.⁹¹

While northern leopard frog numbers in Ontario and eastward look healthy, the distinctive northern leopard frog populations in the Western Boreal/Prairie region are in trouble. Prairie numbers are shrinking; populations are small and isolated in Alberta. British Columbia's once common northern leopard frogs are now officially Endangered under SARA. In fact, in B.C., only the Rocky Mountain population in the southeast remains.

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